More protected lands
Strict regulation & oversight
Greater transparency

COAL ASSOCIATION OF CANADA
Submission to the Alberta Coal Policy Committee

JUNE 18, 2021

COAL ASSOCIATION OF CANADA

The purpose of this submission

The public debate over the future of coal mining in Alberta that began following the June 1, 2020 recission of the 1976 Coal Policy has been intense and emotional. It touches on fundamental values, such as the rights of Indigenous Peoples and the protection of Alberta's mountains, rivers and natural heritage. It takes place in the context of the global response to climate change. While this debate has been difficult and divisive, it has also been healthy.

In the case of the Coal Association of Canada ("Association") and its member companies, it has spurred us to reflect on how we evaluate our environmental and societal effects and engage with our fellow Albertans. We acknowledge the need for better information and improved communication – in order to address evolving public expectations and to provide constructive input into the public policy process.

At its conclusion, this submission recommends a path forward built on three key policy pillars aimed at maximizing the value of Alberta's resources in a way that earns and builds public trust. These are:

- More protected lands
- Strict regulation and oversight that provides certainty and predictability
- Greater transparency

This submission covers the following:

1. Who we are and what we value.
2. How we got here. Specifically, the context of the 1976 Coal Policy and the events that led to the present policy debate.
3. The 1976 Coal Policy is out of date.
4. The existing regulatory framework is comprehensive, but there's room for improvement.
5. The importance of coal mining to Alberta, Canada and the world. In particular, premium steelmaking coal is rare, a strategic Alberta resource and a contributor to Canada's role as a global mining powerhouse.
6. The vital role of steel in our daily lives and as a contributor to a better, cleaner environment.
7. Addressing climate change, and the role of Carbon Capture Use and Storage (CCUS) in making Alberta's high quality thermal coal a viable part of the global clean energy mix for the foreseeable future.
8. Partnerships with Indigenous Peoples, and our Industry's contribution to reconciliation.
9. Job creation and coal's contributions to strong and healthy communities.
10. Addressing public concerns about the coal mining process and its impacts on people, wildlife, water and our natural landscape.
11. Canada's coal mining industry operates with high environmental and social standards, and the world is a better place when it sources its resources from Alberta and Canada.
12. Recommendations: The three pillars of a new coal policy.

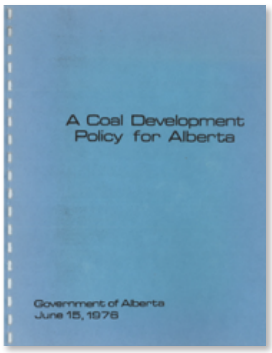
1. Who we are and what we value

The vast majority of those who work for, and benefit from, responsible coal development are Albertans and Canadians. We are your friends and neighbours. Our members invest here because Canada is a law-abiding, rules-based jurisdiction that puts a premium on Indigenous reconciliation, safety, human rights and environmentally responsible resource development.

As Canadians, we are recognized as a "global mining powerhouse". [1] As Albertans, we are the custodians of a rare and high-value resource, steelmaking coal, that is a critical input to the products we all need and want. As mining companies, we see the development of Alberta's coal resources as a privilege, something that needs to happen with the support and confidence of Albertans and Canadians.

We share Albertan and Canadian values. These include open debate and discussion of critical issues; a commitment to facts, openness and honesty; honouring our commitments to and respecting the rights of Indigenous Peoples; cherishing the natural beauty of the Rocky Mountains and protecting our water. Our core values also include creating high-paying jobs in an industry that values safety and human rights.

2. How we got here

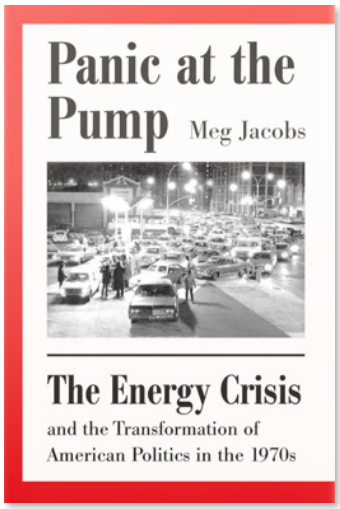


THE 1976 COAL POLICY

Exactly 45 years ago, in June 1976, the Government of Alberta under Premier Peter Lougheed released 'A Coal Development Policy for Alberta', commonly known as the '1976 Coal Policy'. The first sentence in that policy document states 'Alberta's coal resources constitute an enormous potential source of energy, comparable at least to that of Alberta's Oil Sands.'

The 1976 Coal Policy was designed to achieve a balance of economic, social and environmental goals.

The context for that policy is important. Only three years earlier, Canada and its allies were rocked by the 1973 Oil Crisis. As a result of the oil embargo imposed by OPEC in the context of the Yom Kippur War, the price of oil had, by March 1974, risen by 300%. Canada, the US and other allies urgently enacted policies designed to reduce dependence on oil and, particularly, oil from the Middle East. This meant searching for alternative supplies of energy including coal, nuclear and renewable sources. At the same time, there was a belief in Alberta that our oil reserves only had a 15-20 year life. The Washington Post described coal as an "insurance policy once the wells dry up"[2].



Energy Resources Create Boom in Canada's Alberta

Washington Post | July 29, 1979

"…coal, a shiek's ransom of coal that is an insurance policy once the wells dry up."

A Year of Costly Oil And Abrupt Changes

NYTimes | Oct 13, 1975

"Energy touches all aspects of economic life. The savage jump in the price of oil made by the oil cartel—the Organization of Petroleum Exporting Countries — plus the country's new awareness that foreign supplies can be uncertain have hiked the price of coal. Electricity costs, especially those of coastal utilities that burn imported oil beneath their boilers, have rocketed, as customers from Maine to Florida know."

[1] https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/CMMP/CMMP_The_Plan-EN.pdf

[2] https://www.washingtonpost.com/archive/politics/1979/07/29/energy-resources-create-boom-in-canadas-alberta/214b2732-4eb8-4e52-a21f-f90b2069e09b/

With rapidly growing demand for Alberta coal, the government responded to public anxiety about the potential impacts of unrestricted coal mining. The resulting 1976 Policy was a framework that encouraged coal development while striking a balance between economic, social and environmental goals. The Policy also provided a regulatory framework that incorporated cross-departmental requirements for an environmental, social and technical approval processes.

The best-known feature of that policy is the 'four categories' approach to designating activity areas. Categories were established "having regard to questions of environmental sensitivity, alternate land uses, potential coal resources and the existing development of townsites and transportation facilities…"[3] The policy goes on to say "[the] Government emphasizes that the present classification, while based upon the best available knowledge, is subject to review in the light of changing knowledge and new technology, related to environmental protection, reclamation and mining methods."[4]

To summarize the 1976 categories:

- **Category 1** lands were and are the most sensitive from a natural and environmental perspective and no development is permitted. It includes National Parks, present or proposed Provincial Parks, Wilderness Areas, Natural Areas, settled urban areas and other places where it was determined that alternate land uses have a higher priority than coal activity. As a result of provincial and federal policies since 1976 to designate more land as protected, Category 1 is significantly larger today than it was in 1976.
- **Category 2** lands were described as areas in which limited exploration is desirable but commercial development by surface mining "will normally not be considered at the present time". It contains lands in the Rocky Mountains and Foothills "for which the preferred land or resource use remains to be determined, or areas where infrastructure facilities are generally absent or considered inadequate…". In addition this category contains "local areas of high environmental sensitivity…"[5]
- **Category 3** comprises areas in which "...exploration is desirable and may be permitted under appropriate control…" and mining will be permitted "subject to proper assurances respecting protection of the environment and reclamation of disturbed lands and as the provision of needed infrastructure is determined to be in the public interest."[6] It covers the Northern Forested Region and eastern portions of the Eastern Slopes. It also covers agricultural lands in settled regions of the province.
- **Category 4** covers areas "in which exploration may be permitted under appropriate control and in which surface or underground mining or in-situ operations may be considered subject to proper assurances respecting protection of the environment and reclamation of disturbed lands. This category covers the parts of the province not included in the other three categories".[7]

3. The 1976 Coal Policy is out of date

The world has changed dramatically since 1976. As the 1976 Policy foresaw, we now have better "…knowledge and new technology, related to environmental protection, reclamation and mining methods."

The global context has also changed. The driving motivation behind the 1976 policy was the need to responsibly develop coal as a fuel source in the aftermath of the OPEC oil shock. The policy was appropriate to the times, but it makes far less sense today. Here's why:

- **It didn't foresee the global challenge of climate change.** With a major focus on the development of thermal coal for domestic power production, the 1976 Policy was poorly suited to regulating the development of steelmaking or thermal coal intended for export. With the increasing knowledge of the global effects of CO_2 emissions from thermal coal use in power generation, the Policy did not foresee that a transition would take place in the economics of steelmaking coal developments. That transition has placed a premium on the type of hard steelmaking coal that formed the basis of much Alberta export coal mining in the past. It is this premium marketplace that is the basis of new proposed development within historic mining areas.

[3] 1976 Policy, p. 14.
[4] 1976 Policy, p. 17.
[5] 1976 Policy, p. 15.
[6] 1976 Policy, p. 16.
[7] 1976 Policy, p. 16.

- **It fails to consider Indigenous Peoples and their rights.** While the 1976 Policy discussed the interests of Albertans generally, it was put in place prior to the recognition of Indigenous rights that belatedly occurred with the inclusion of Section 35 in the *Constitution Act*, 1982. It also predated the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP), which was adopted in 2007. UNDRIP enshrined rights that constitute the "minimum standards for the survival, dignity and well-being of the Indigenous Peoples of the world."[8] The Association and its member companies, in the spirit of Section 35 and UNDRIP, are working closely with Indigenous partners to fulfill our mutual aspirations.
- **It doesn't account for the advancement of environmental legislation and changes in land use that have occurred since 1976**. It is notable that the 1976 Policy uses language like "...at the present time" and "remains to be determined" in connection with potential exploration and development. Policymakers at the time clearly contemplated that changes could and should happen that would allow for responsible development, particularly in Category 2, at some point in the future. However, the 1976 Policy was silent on the question of the criteria that would be applied to determine the conditions under which such development should take place. The Association and its members believe that growth in global demand for hard, steelmaking coal, the relative rarity of economically viable deposits globally, improvements in mining and reclamation techniques, improvements in safety and strong efforts to advance Indigenous participation in, and benefits of, development, call for a rethink of the approach to exploration and development.

Information Letter 2020-23 stated that with the recission of the 1976 Coal Policy "…all restrictions on issuing coal leases within the former coal categories 2 and 3 have been removed." Many Albertans were alarmed by such a definitive statement without the context of knowing that issuing a coal lease does not in any way absolve the lessee of all the regulations surrounding the development of coal projects. The result has been that a significant segment of the population, plus advocacy groups, took the strong inference that all restrictions on "coal mining" were removed when, in fact, this was not the case.

4. Coal mining in Alberta is comprehensively regulated

In the 45 years since the 1976 Policy was released by federal, provincial and municipal governments – reflecting new information, better science and changing market dynamics – have enacted a comprehensive set of policies, statutes and regulations that have rendered the 1976 Policy obsolete.

The provincial regulations governing the development of coal projects are mostly found within seven provincial statutes and 18 regulations totaling 1,030 pages. This doesn't include relevant manuals, directives, guidelines, handbooks, information letters and regional plans made pursuant to these laws and regulations.[9]:

- The *Coal Conservation Act* and the two regulations made pursuant to the Act contain the regulatory regime administered by the Alberta Energy Regulator (AER) for the development of coal and regulated facilities in Alberta.

7 Provincial Statutes

18 Regulations

1,030 pages

+ MANUALS, DIRECTIVES, GUIDELINES, HANDBOOKS, INFORMATION LETTERS AND REGIONAL PLANS

+ FEDERAL REGULATIONS

[8] https://indigenousfoundations.arts.ubc.ca/un_declaration_on_the_rights_of_indigenous_peoples/

[9] https://open.alberta.ca/publications/

- The *Environmental Protection and Enhancement Act* and 11 relevant Regulations are the primary instruments through which requirements for air, water, land and biodiversity are managed. The Act supports and promotes the protection, enhancement and wise use of the environment by designating proposed activities (including proposed coal mines) for which an approval or registration is required.
- The *Public Lands Act* and three relevant regulations govern the role of the Alberta government in managing public land. It applies to current and proposed coal developments on crown land.
- The *Water Act*, and the regulations applicable to specific watersheds supports and promotes the conservation and management of water, and deals primarily with the allocation of water rights and the establishment of water management frameworks.
- The *Mines and Minerals Act* provides the Government of Alberta with the authority to administer, allocate and enter into agreements with respect to minerals, including coal and sets out, among other things, the royalty payment obligations of mining companies.
- The *Alberta Land Stewardship Act* (ALSA) provides the legal basis for regional land-use planning and was put in place in 2009 to plan for the future needs of Albertans by managing development and growth, while respecting property rights. The South Saskatchewan Regional Plan (SSRP) was approved pursuant to the Act in 2014 and was amended in 2018 to incorporate newly established parks and sub-regional plans. Integrated Resource Plans developed under this legislation deal with matters of public interest including air and surface water quality and related monitoring, evaluation and reporting requirements and zones for, and limits on, development. The ALSA's modern approach to land classification is relevant to any assessment of the coal policy categories.
- The *Responsible Energy Development Act* grants the AER its powers and mandate and establishes the AER as an independent, quasi-judicial administrative tribunal. As such, the regulator is not an arm of government or government department.

Coal mining is also subject to the *Historical Resources Act* administered by *Alberta Culture and the Occupational Health and Safety Act*, Regulation and Code administered by Alberta Labour.

In addition to this comprehensive body of provincial legislation, some proposed developments are subject to federal review by the new Impact Assessment Agency of Canada under the *Impact Assessment Act*, 2019 , the *Fisheries Act* and their regulations, including the *Coal Mining Effluent Regulations*. Pursuant to these federal laws, the Government of Canada, on June 11, 2021 made a Policy Statement containing a more stringent test for new thermal coal mining or expansion projects.

Where a proposed coal project falls under federal and provincial jurisdiction, it is reviewed by a Joint Review Panel (JRP) that hears evidence from a wide range of interested parties and makes science-based recommendations to the federal and provincial governments on the advisability of issuing a development license and the conditions that should be attached where a license is issued. A JRP will typically receive thousands of comments on topics including Indigenous Rights, fish and fish habitat, wildlife and habitat, climate change, surface and groundwater quality, drinking water, species at risk, biodiversity, human health and wellbeing, air quality, recreation, tourism, fishing, soil, migratory birds and visual aesthetics.

By any measure, coal mining in Alberta and Canada is comprehensively regulated and project developers deploy extensive safeguards to deal with a range of risks and potential issues. As rigorous as the current regulatory processes are, we acknowledge the need to address areas of public concern and look for realistic improvements.

5. Alberta's premium steelmaking coal is a key strategic resource

PREMIUM STEELMAKING COAL IS RARE

Coal is the world's most widely distributed fuel source and is found in most regions. Most of this coal, however is thermal coal that lacks the special physical properties required for the steelmaking process. Steelmaking coal and in particular high quality coking coal, is rare and found in export-quality deposits in a small number of discrete regions including central Queensland, Appalachia, central China, eastern Siberia and western Canada. It is produced in other regions but not at the same quantity or quality. Canada's surplus infrastructure capacity, very high-quality steelmaking coal, rule of law, skilled labour and desire to attract investment make it highly attractive as one of the regions with this rare commodity.

CANADA HAS UNIQUE TRANSPORTATION AND INFRASTRUCTURE ADVANTAGES

Canada's infrastructure advantage, including access to world-class deep-water ports, allows for shipping on larger vessels that use less fuel per unit shipped on the longest part of the journey to international markets. Canada's railways, CN and CP, both have an ability to move commodities efficiently compared to peers. The fact that this rail and port infrastructure has already been built is a major advantage that reduces the indirect carbon footprint of coal produced in Canada. To the extent coal is mined and shipped from Canada, it avoids the need to develop massive and disruptive new infrastructure elsewhere and provides Canada with significant economic advantages while contributing to a cleaner global environment.

CANADA'S STEELMAKING COAL IS IN HIGH DEMAND WORLDWIDE

Steelmaking coal is a key ingredient in the production of steel, which is widely used throughout the world in essential everyday products. According to Natural Resources Canada, Canada is the fourth largest exporter of steelmaking coal in the world and holds some of the largest coal reserves. In 2019, Alberta and British Columbia produced up to 83% of Canada's coal supply.[10] Canada's steelmaking coal production is exported worldwide, to countries seeking high-quality steel making coal.[11] In 2019, Canadian exports of coal were valued at $7.1 billion, making a significant contribution to Canada's economy.[12] Cost-effective and reliable coal supply provides an economic advantage to Alberta and Canada.

CANADA AS A MET COAL EXPORT POWERHOUSE

(2018 Seaborne Trade)

EXPORTERS			IMPORTERS		
Australia	179	59%	India	52	17%
USA	51	17%	Europe	50	17%
Canada	28	9%	Japan	47	15%
Russia	16	5%	China	37	12%
Rest of world	32	10%	Korea	36	12%
			Rest of world	82	27%

Source: IEA (2018). All Rights Reserved.
Unit: Million Metric Tonnes

[10] https://www.nrcan.gc.ca/science-and-data/data-and-analysis/energy-data-and-analysis/energy-facts/coal-facts/20071

[11] https://www.ramcoal.com/assets/docs/ppt/Coal-mining-booklet-final.pdf

[12] https://www.nrcan.gc.ca/science-and-data/data-and-analysis/energy-data-and-analysis/energy-facts/coal-facts/20071

6. Coal mining provides an input to vital products for human life and well-being. It contributes to high global standards of living, human health and a cleaner environment

Steel is a vital material in modern society. As expressed by the World Steel Association, steel is:

- One of the world's most innovative and essential materials
- Infinitely recyclable and exceptionally strong, steel offers an array of sustainable benefits
- Produced in every region of the world, steel generates jobs and economic growth
- Used in every aspect of our lives

Alberta's steelmaking coal plays an important role in the production of thousands of critical everyday items. The COVID-19 vaccines are being distributed through surgical steel needles. Steel is found in common objects such as Apple's iPhone X, which features a stainless-steel band for its case. In cookware, pots are commonly made of stainless steel and many household appliances contain steel. Further, steel is an essential element used in agriculture, for tractors and farm equipment as well as in the manufacture of cars, trains, airplanes, recreational vehicles. It is used to develop roadways and bridges, build homes, schools and hospitals. It is widely used to transport and deliver clean water.

STEEL IS A KEY INGREDIENT IN RENEWABLE ENERGY INFRASTRUCTURE AND THE CARS AND TRAINS OF THE FUTURE

The Government of Canada confirms that steel has a critical role to play in building green energy infrastructure as the world transitions to a low-carbon economy. Alberta's steelmaking coal is needed to build renewable energy infrastructures like wind turbines, solar panels, tidal power systems and bioenergy infrastructure. It is also the primary material in the transportation modes of the future, including electric vehicles and high-speed trains.

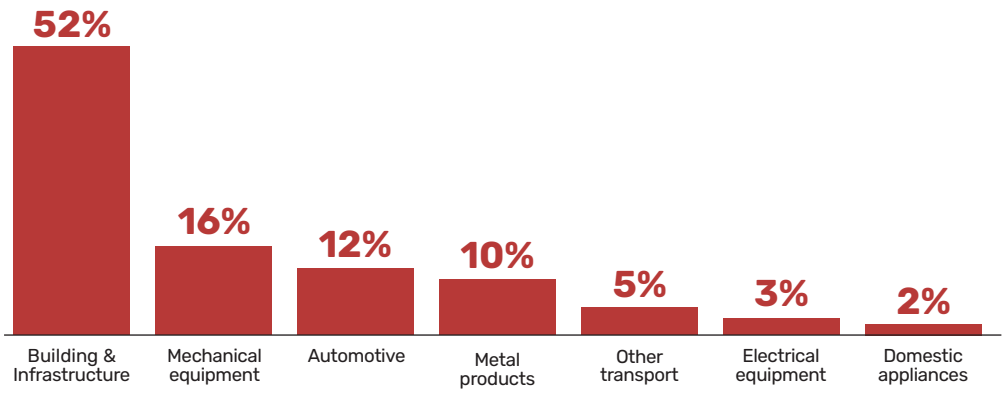
The World Steel Organization reports that steel plays a key role in converting solar energy into electricity or hot water by acting as a base for solar thermal panels and in pumps and tanks. Further, when we think of hydroelectricity, we are reminded that steel is required to reinforce concrete dams. Almost every component of a wind turbine is made of steel. Equally, steel is the main component of a tidal turbine in a tidal energy system, used to fabricate wave energy devices. Steel is also used in nuclear and fossil fuel-based energies — whether that be for mining equipment, storage tanks, and power plants. Canadian steelmaking coal is vital to the creation of steel, which in turn is key to developing renewable energy infrastructure. Alberta should leverage its steelmaking coal resources to be a leader in the development of renewable energy infrastructure.

Alberta's electrical infrastructure features significant wind power. An industrial wind turbine requires around 225 to 285 tonnes of steel[13] which would require 175 to 220 tonnes of steelmaking coal.[14]

[13] ArcelorMittal Belgium

[14] Based on WorldSteel value of 780kg steelmaking coal to produce one tonne of steel.

USES OF STEEL



Source - World Steel Association, 2020 World Steel Figures. www.worldsteel.org

As urbanization continues and cities expand, steel demand is expected to grow. According to the International Energy Agency, global demand for steel is projected to increase more than a third by 2050.[15]

7. Addressing climate change: CCUS and the future of thermal coal

Climate change is a real problem that the world is coming together to solve. The coal industry understands the gravity of climate change and is adapting to lower its environmental impact.

A recent report by the International Energy Agency (IEA) looked at the world's ability to transition to a net zero energy system by 2050. Its report suggests that to achieve this goal, the world needs "strong and credible policy actions from governments, underpinned by much greater international cooperation".

Today, the coal industry is making changes and improving efficiency to reduce its environmental impact, at the same time as it contributes almost 40% of the world's electricity. The industry is using existing technologies, and researching new ideas, to reduce its environmental footprint, with a focus in reducing air emissions and water impact. This includes carbon capture use and storage (CCUS), which was recognized in the Paris Climate Accord as a viable solution to help address greenhouse gas emissions.

This year the need for affordable energy sources became apparent in Europe, which increased consumption of thermal coal as a result of shortages of natural gas in a cold winter.[16]

CCUS facilities, like that at the Boundary Dam power station near Estevan, Saskatchewan has been in commission for several years. It presents an opportunity to allow for affordable energy forms to remain part of the energy mix of the future.

Environment Minister McKenna says carbon capture part of solution to climate change

Regina Leader Post | May 25, 2016

If first impressions count, federal Environment Minister Catherine McKenna sounded impressed after her first look at the carbon capture and storage (CCS) plant at Boundary Dam power station near Estevan. McKenna, who trained as human rights and social justice lawyer, toured the $1.5-billion CCS plant on Wednesday along with Saskatchewan Environment Minster Herb Cox and SaskPower executives.

[15] https://www.iea.org/reports/iron-and-steel-technology-roadmap
[16] https://finance.yahoo.com/news/gas-scarce-europe-coal-making-060000153.html

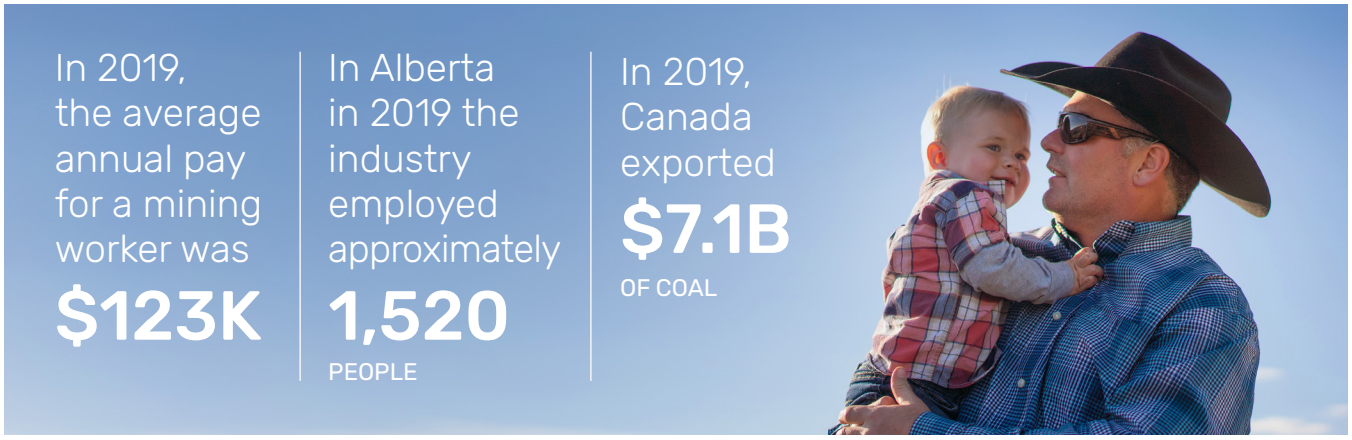
8. Indigenous partnerships, and our contribution to reconciliation

The mining industry works closely with Indigenous Peoples in Canada, with nearly 500 mining agreements signed since 1974, including many in the coal mining sector.[17] Most of these agreements have come in the last decade as the industry increases its efforts to engage in the most meaningful ways with Indigenous communities. Many of these agreements have come in association with coal projects such Cardinal River, CST Coal, Vista and Riversdale Grassy Mountain. Through building meaningful partnerships, we can advance reconciliation and grow Indigenous participation in the economy.

The coal industry recognizes that early and extensive consultations with Indigenous communities is necessary for any new project. For example, Riversdale Resources' Grassy Mountain began extensive consultations in the region five years ago at the earliest stages of the project, and incorporated Indigenous-led feedback, concerns, and input into their project from the very beginning. This led to Riverdale Resources securing support letters for their project from all of the Treaty 7 First Nations, as well as the Métis Nation of Alberta.

There are significant economic opportunities from the mining industry for Indigenous Peoples in Canada. In 2016, 16,500 Indigenous people worked in the mining industry.[18] Proportionally, the mining industry is the largest private sector employer of Indigenous people in Canada, with 7.4% of the workforce identifying as Indigenous versus an average of 3.9% in all other industries. Indigenous participation in the mining workforce continues to grow, as this number was at roughly 5% in 2011.[19]

9. Coal mining creates jobs and contributes to strong and healthy communities



In Canada, the coal industry directly employs approximately 5,500[20] people and is responsible for creating another 2,700 indirect jobs.[21] In Alberta in 2019 the industry employed approximately 1,520 people, not including indirect jobs. Coal provides high-paying jobs, as compensation in the mining industry is the highest of any industrial sector in Canada. In 2019, the average annual pay for a mining worker was $123,000, approximately $40,000 higher than annual average compensation for those working in the forestry, manufacturing, finance and construction sectors.[22]

In 2019, Canadian exports of coal were valued at $7.1 billion, making a significant contribution to Canada's economy.[23]

Coal also helps pay for healthcare and education, through taxes and royalties. If the past five years, coal royalties to the Alberta government have ranged between $8 million and $23 million per year.[24]

[17] https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/CMMP/CMMP_The_Plan-EN.pdf
[18] https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/CMMP/CMMP_The_Plan-EN.pdf
[19] https://mining.ca/wp-content/uploads/2021/02/FF-2020-EN-Web.pdf
[20] Coal Association estimate.
[21] Based on NRCan Mineral Sector Employment (Jan 2019) estimate for all mining in Canada.
[22] https://mining.ca/wp-content/uploads/2021/02/FF-2020-EN-Web.pdf
[23] https://www.nrcan.gc.ca/science-and-data/data-and-analysis/energy-data-and-analysis/energy-facts/coal-facts/20071
[24] www.alberta.ca/CoalEngagement

The economic importance of the coal industry to local communities cannot be overstated. Coal provides high paying jobs locally, in addition to indirectly creating other jobs in supplier industries, hotels, restaurants, and more. Coal companies are often the leading corporate citizens in these communities, providing sponsorships and donations to community clubs, events, colleges, and community projects. Coal generates a significant and reliable tax revenue for rural municipal governments, many of which in Alberta are currently struggling with reduced revenues.

While coal has the ability to build a strong local economy, conversely, the shuttering of a coal mine can devastate a local economy by causing significant job losses, a population decline, a collapse in property values and tax revenue shortfalls. Several Alberta communities have felt the pain of mine closures.

Alberta can help meet long-term global demand for steelmaking coal while creating thousands of high-paying jobs. A new development could employ approximately 400-500 workers during the construction period and create approximately 300-400 full-time jobs during a mine's life.

10. Addressing public concerns about the impact of coal mining

MANAGING SELENIUM: THE 'MULTIPLE LINES OF DEFENSE' APPROACH

Selenium is an element that occurs naturally and is an essential mineral for all living things, including people, animals and plants.

Selenium in its natural form is contained in certain rock formations and is exposed in various quantities during mining of these rock formations, as the rock is disturbed. However, selenium concentrations beyond certain thresholds can be harmful. In particular, egg-laying animals such as aquatic birds, fish and amphibians are more sensitive to elevated selenium concentrations compared to mammals.

Scientists have put forward a number of recommendations on how best to monitor and manage selenium using a variety of strategies. The industry has, and will continue to adopt, a 'multiple line of defense' approach that is part of the mine and landform design process. More detailed analysis and recommendations related to selenium are provided in the expert submission prepared by Guy Gilron and Gord McKenna dated June 7, 2021, included as Appendix E in this document.

MINIMIZING WATER USAGE, PROTECTING QUALITY AND FISH HABITAT

The industry is committed to reducing water use and ensuring water meets applicable water quality standards before being returned to the natural system. Water is typically used by the coal industry in processing, transportation, cooling and for dust control. We use a variety of methods to optimize our water use and to protect the waterways, including:

- Modern coal handling and preparation plants (CHPP) are highly efficient at mechanically dewatering the product and waste streams to reuse the water within a closed loop plant.
- As a result of the adoption of these modern water management systems, 80% or more of water is recycled, minimizing the draw on natural water sources.
- Where tailings impoundments are used, the plant water is recycled back to the plant for reuse as the tailings are dewatered. Many new projects plan to eliminate tailings by mixing the plant waste with mining rock with centrifuges and filters used to recover most of the water from the waste for reuse in the plant.

- Site water management designs are a major part of feasibility and permit application work. This includes detailed modeling of all water flows on site to most effectively design the interception and diversion of water away from the mine that sheds outside the mining area, water flows within the disturbed mining area from surface and subsurface flows, management of water flows to passive and active treatment facilities, and final release of treated water that meets regulatory water quality standards.
- The design includes such elements as:
    - Testing all water used and ensuring it meets water quality specifications before being released.
    - Diverting water from rock disposal areas to reduce selenium leaching.
    - Pumping and ditching designs to direct water to treatment facilities including end-pit water bodies, saturated rock fills, bioreactors, treatment plants, fabricated wetlands and settlement ponds.
    - Circulating water, where necessary, through engineered saturated backfill zones to reduce selenium and other nitrates.
    - Optimizing rock storage to reduce exposure to oxygen and water to reduce selenium levels.
    - Monitoring groundwater and surface water to ensure water quality meets required levels.
    - Managing waterways upstream or downstream of the mine where enhancement or replacement of habitat is a mitigation built into the management plan.
    - Avoid tailings ponds, where possible.
    - Implementing progressive reclamation to cover rock disposal areas as quickly as possible.

PROTECTING NATURAL HABITAT AND WILDLIFE

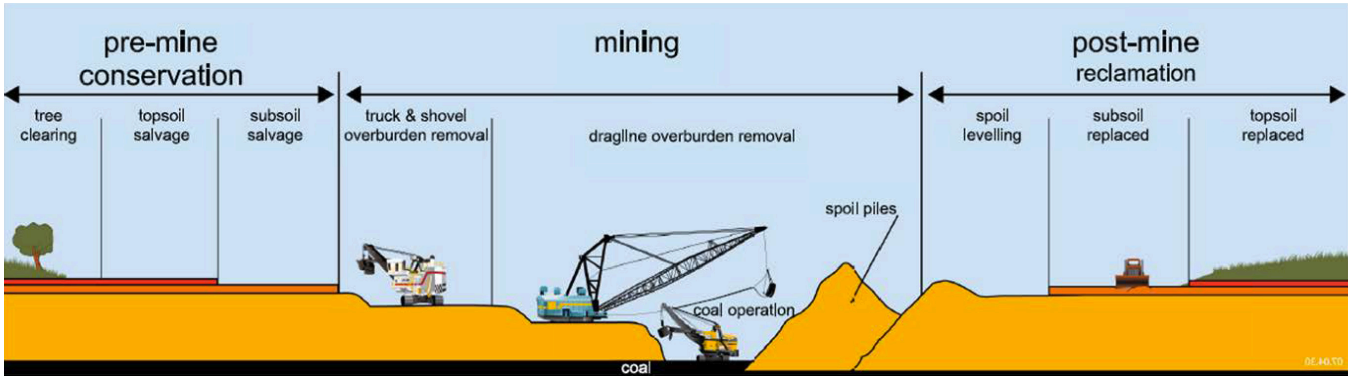
To reduce the environmental impact of coal mining, the industry uses careful pre-planning, regular monitoring of the surrounding environment, operational control measures and progressive reclamation practices. Preserving and promoting biodiversity is key to limiting our impact and the coal industry is committed to mitigating risk in order to protect high value areas and habitats.

Several years before coal mining can begin, we consult with Indigenous Peoples and engage with them to prepare Traditional Land Use and Traditional Ecological Knowledge studies. Through building relationships, the intent is to establish communication protocol agreements, working partnerships and, in some cases, impact benefit agreements. In parallel, we prepare thorough environmental impact assessments, engage the public and other interested stakeholders to understand any potential concerns, and provide detailed information to provincial and federal regulatory agencies. Where mining is approved, strict regulations ensure disturbed land is returned to an acceptable state once operations are completed.

Before work starts, we carefully study the existing environmental conditions of the mine site and surrounding area. We conduct comprehensive environmental baseline studies to ensure all ecosystem values are measured and incorporated in project planning and design. These studies help identify any existing conditions and potential concerns and also guide the reclamation of the mine site. Studies include air quality, noise assessments, surface and groundwater assessments, local vegetation mapping, wildlife studies (including fish, birds, and land animals), soil testing and land resource studies. The findings are reviewed by technical parties, local stakeholders and government authorities prior to a mining permit being approved by the relevant government authorities.

LAND RECLAMATION

Land reclamation is an integral part of the mining process. Before mining approvals are given or production begins, reclamation plans covering the entire life cycle of a coal mine must be designed and approved. The cost of the rehabilitation of the mined land is factored into the mine's operating costs and companies are required to post financial security with the Alberta Energy Regulatory to financially secure the reclamation costs during operations. This means Alberta taxpayers have no exposure to reclamation liabilities associated with coal mining – these are fully covered by industry through the Mine Financial Security Program.



Source - TransAlta (2015) Whitewood Land Reclamation.

Progressive reclamation is an industry best practice that allows reclamation to start earlier, restoring the land more quickly, limiting the overall impact on an area and speeding up wildlife habitat restoration. Under progressive reclamation, work to reclaim the land starts as soon as an area has been mined, rather than waiting for the entire project to be completed. This approach not only speeds up the reclamation but also allows the final result to benefit from experience learned throughout the process.

PROTECTING THE NATURAL AESTHETICS OF THE EASTERN SLOPES

"Mountaintop removal" is not a practice commonly associated with Canadian mining, and will not be employed in Alberta. Rather, it is a feature of surface mining in the Appalachian coalfields of the eastern US. It features areas where the mountains are tightly spaced and low-lying. Put simply, the mountains are removed to recover the coal and the valleys between the mountains are filled with the waste rock. The United States Environmental Protection Agency defines mountaintop mining as "a practice where the tops of mountains are removed, allowing for almost complete recovery of coal seams while reducing the number of workers required to a fraction of what conventional methods require. Mountaintop mining can involve removing 500 feet or more of the summit to get at the buried seams of coal. The earth from the mountaintop is then moved into neighboring valleys."[25]

The mountain terrain in Canada is vastly different from Appalachia. In recognition of their special status, vast areas of the iconic Alberta high country have been added to parkland and protected areas since 1976. Permitting of surface mining in the mountains must take into account the aesthetic and inherent cultural values of these areas.

Surface mining provides the industry with the ability to efficiently and economically mine geologically complex and high-overburden-to-coal ratio deposits that are not accessible through traditional underground mining methods. Alberta has a long track record of embracing innovation to responsibly extract our natural resources and new projects will make use of the latest technology and practices. Canada competes with the most productive steelmaking coal exporting regions of the world through the very high efficiencies we are able to achieve in our surface mines.

In this manner, we can meet global-long term demand for steelmaking coal right here in Alberta while protecting the environment through our world class efforts in progressive reclamation and water management.

[25] https://www.epa.gov/water-research/mountaintop-mining-research

11. Canada's coal industry operates under high environmental and ethical standards

Canada's coal is among the most ethically and responsibly mined in the world. The coal industry follows strict regulations that protect the environment and minimize the industry's impact on waterways, wildlife and natural habitat. Regulations also ensure the safety of workers, fair treatment of neighbouring communities and Indigenous Peoples' rights.

Global coal production has remained in the 7,500 to 8,000 million tonne (Mt) range over the past few years, with China, India and Indonesia providing over half the world's coal supply. These countries tend to produce a lower quality coal with less regulatory oversight than Canada.

A reduction in Canada's coal production would likely not lower the coal industry's environmental impact. In fact, any reduction in coal production by Canada would likely be replaced by less ethically produced coal, contributing to greater environmental impact and increased human rights concerns.

GLOBAL COAL PRODUCTION, 2018-2020

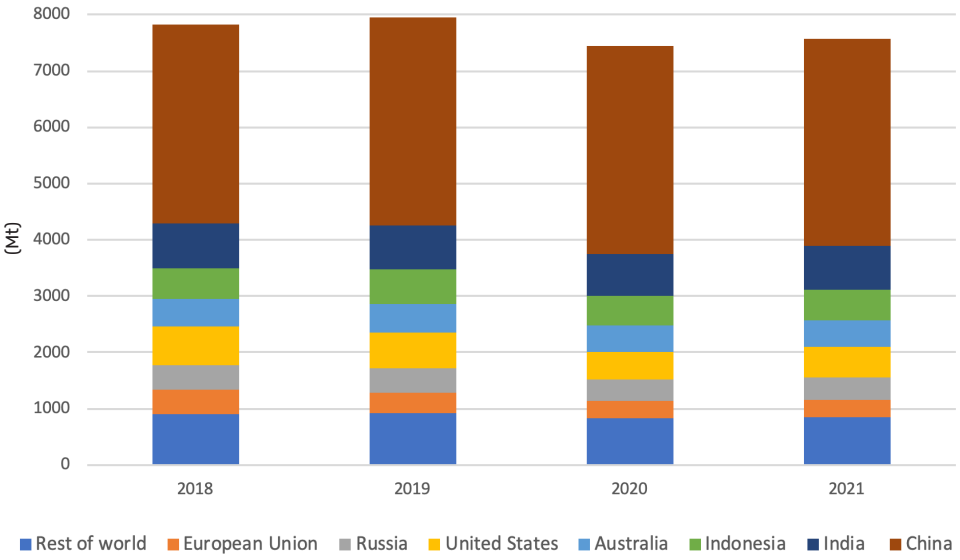


Chart includes both thermal and steelmaking coal
Source: IEA (2020) Coal 2020. All rights reserved.

12. Since the world needs Alberta coal, is there a way to develop it responsibly? The short answer is Yes

Our recommendations:

The reinstatement of the 1976 Coal Policy and the present process, while creating uncertainty and confusion, also provides an opportunity to get it right. We have heard the concerns expressed by Albertans and are committed to addressing them. There is a critical need for a well-informed discussion of the realities of coal mining. It is up to us, the Association and its members, to provide this information. Only then can citizens and governments evaluate our activities and future plans against the values that matter to them.

The Association believes the new policy framework should explicitly recognize the rights of Indigenous Peoples, help contribute to Alberta's efforts to address climate change and create certainty for investors who wish to create jobs for Albertans and contribute royalties to Alberta's government. Based on this, we recommend a three-pillar policy as follows:

1. MORE PROTECTED LANDS

The amount of land currently covered by the 1976 Category 1 represents 12.4% of Alberta's total land base and 44% of the Eastern Slopes.[26] In addition, since 1976, the Eastern Slopes Policy and related Resource Management Plans have been put in place. These have provided added protection to, and limited development within, areas included within Categories 2, 3 and 4 (including the Eastern Slopes). Even with the substantial layers of protection now in place, we believe there is an opportunity to expand the areas that are off-limits to coal activity, including parts of what is now considered Category 2 and almost all of Category 3. A new coal policy should contain a mechanism to increase protected lands in consultation with leaseholders, Indigenous communities and other stakeholders.

2. STRICT REGULATION AND OVERSIGHT THAT PROVIDES CERTAINTY AND PREDICTABILITY

For lands that could and should be considered for coal exploration and development, we believe in the need for clear regulations and processes that would allow for the evaluation of applications and proposals on their own merits. These should take into account partnerships with Indigenous communities, management and reclamation plans, water protections, environmental impacts, social and economic impacts as well as a range of land-use planning factors such as proximity of infrastructure and local community needs.

3. GREATER TRANSPARENCY

To meet the need for public confidence and support, we recommend that the public be given greater access to information about proposed projects in order to fully understand and evaluate the full range of project impacts and benefits including Indigenous partnerships, jobs, community investment, impacts on the environment, landscape, wildlife and waterways.

In order for these pillars to be effective, the new policy should include:

- An open, transparent mechanism, with clear criteria, for shifting land from one category to another, in accordance with land-use planning principles.
- Determining a mechanism to acknowledge existing projects in exploration or development stages in order to provide as much planning certainty as possible to project proponents.

Conclusion

As we said at the outset, and as recognized by Federal and Provincial leaders, Canada is a mining powerhouse. Albertans are the custodians of a strategic resource that can and should be developed in accordance with Alberta and Canadian values. We view the right to develop this resource as a privilege and take our obligations to the broader community seriously. We believe there is a critical role for coal for the well-being of humanity now and into the future and that Alberta has a unique opportunity to be the global leader in responsible coal development. The information and recommendations in this submission are intended to help set the stage for a constructive, respectful and honest discussion. We appreciate the opportunity to make this submission.

[26] Based on total surface area of 661,848 sq. km. (Statistics Canada).

Appendix

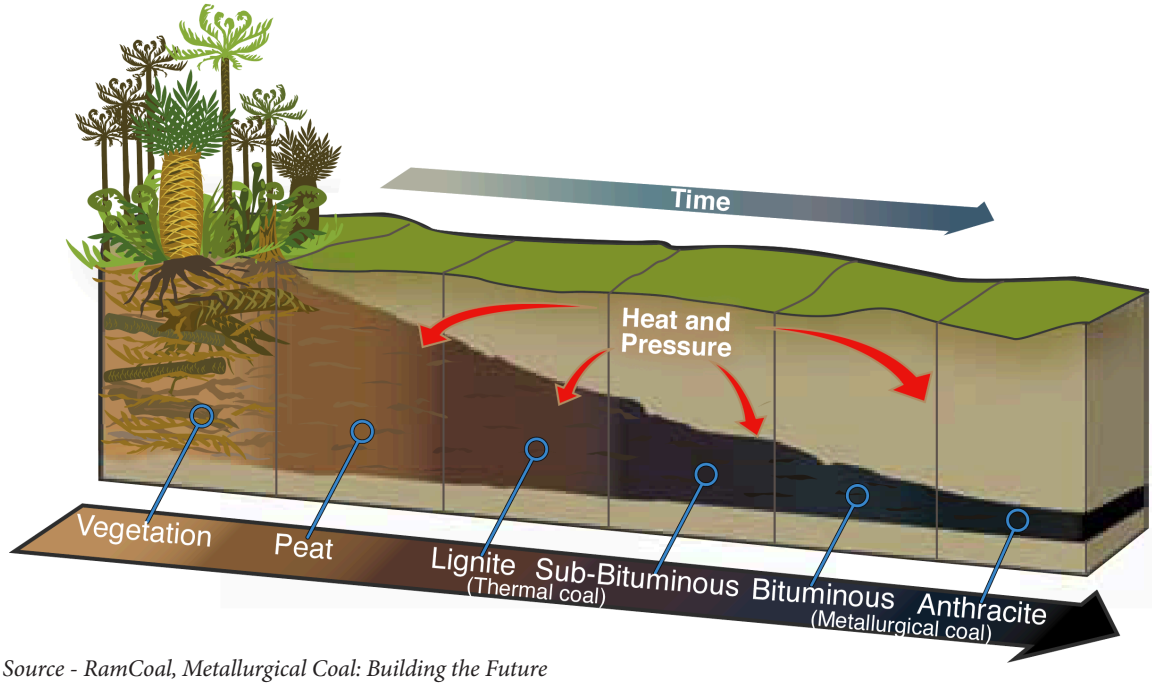
A Coal Basics
B The Coal Mining Process
C Making Steel from Coal
D Carbon Capture, Use and Storage (CCUS)
E Gilron/McKenna Report on Selenium Management

APPENDIX A – COAL BASICS

The basics: what is coal?

Coal is a naturally occurring sedimentary carbon-rich organic rock found in the earth's crust. It is formed from buried vegetation that has been heated and compressed over millions of years. These pressures cause physical and chemical changes in the vegetation and transform it into peat and then into coal.

FORMATION OF COAL



Source - RamCoal, Metallurgical Coal: Building the Future

What are the different types of coal and how are they used?

Coal quality varies depending on its composition and the extent that the original organic material has transformed into carbon, a process known as "coalification". This process can be affected by the type of vegetation, depth of burial, tectonic forces and the time the coal has been forming. Coal is typically classified into two major categories, depending on its quality and end use - thermal coal and steelmaking coal.

THERMAL COAL

Thermal coal (high volatile bituminous, sub-bituminous and lignite coal) has lower carbon content and is typically used for heating, industrial processes, and electricity generation. To generate electricity, thermal coal is burned to create steam which in turn drives turbines that generate electrical power.

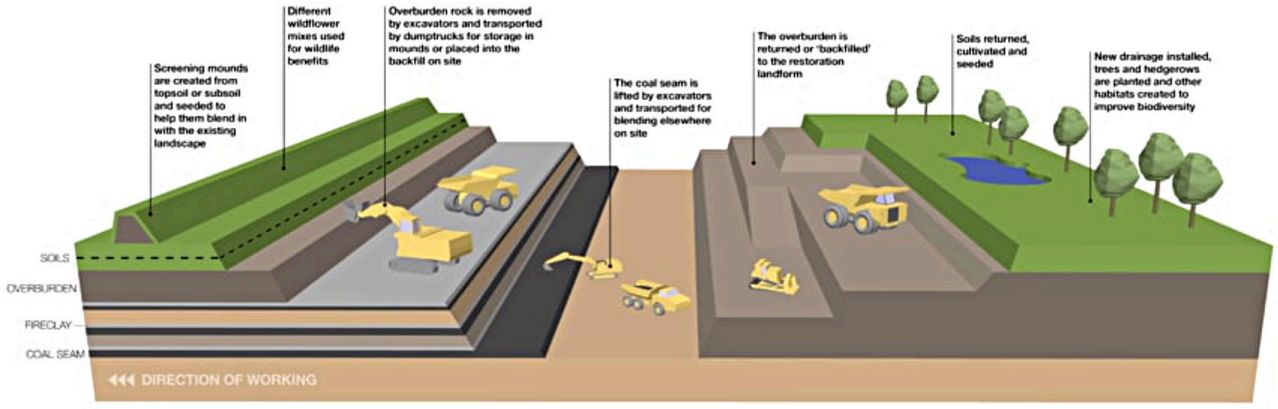
STEELMAKING COAL

Steelmaking coal (anthracite and bituminous coal) has a higher carbon content and as the name suggests, is a key ingredient in producing steel. Steelmaking coal is also referred to as steelmaking coal and includes coking coal, which has the unique property of softening when heated in the absence of oxygen, then re-hardening as it continues to heat up. Steelmaking coal is more valuable than thermal coal and is found only in a few places worldwide, with Australia, the US and Canada producing over 75% of the world's supply (source iea.org). Canada's steelmaking coal is of very high quality and ongoing global demand for steel makes it a valuable resource.

APPENDIX B – THE COAL MINING PROCESS

Coal mining uses two primary methods, depending on the geology of the coal deposits: surface mining, where coal deposits are closer to the surface and underground mining, where the deposits are buried deep below the surface.

In surface mining, the cover soil (near-surface soil with organic material and growing potential), is selectively removed and carefully preserved for later use in the land reclamation process. Non-productive soil and other overburden materials are also removed to expose the coal seam. Once the coal seam is exposed, it is systematically mined and then loaded onto trucks or conveyors to be taken to a coal preparation plant or directly to where it will be used. As work is completed the cover soil is replaced and the land is reclaimed.



Source - Banks Mining, About Surface Mining. www.banksgroup.co.uk

For underground mining, the entrance to underground workings is generally established with an excavation, such as a small open cut to expose the coal seam, or tunnel works close to where the coal seam intersects the surface. Specialized equipment is used to develop the main tunnels and, along with continuous miners, establish secondary mains and cross cuts to define underground mining panels. In a room and pillar mine, the individual panels are then removed with continuous miners cutting the coal and shuttle cars hauling it to the conveyor which carries it to surface. This leaves pillars to support the ground during and after mining. Where pillar recovery is possible, the pillars are removed with temporary roof supports in place which are then removed to allow the controlled collapse of the panel.

The highest productivity underground mines employ longwall machines that continuously mine and entire panel in successive slices that form the long wall. The overlying rock collapses behind the longwall machine, controlled by hydraulic shields that guide the collapsing roof.

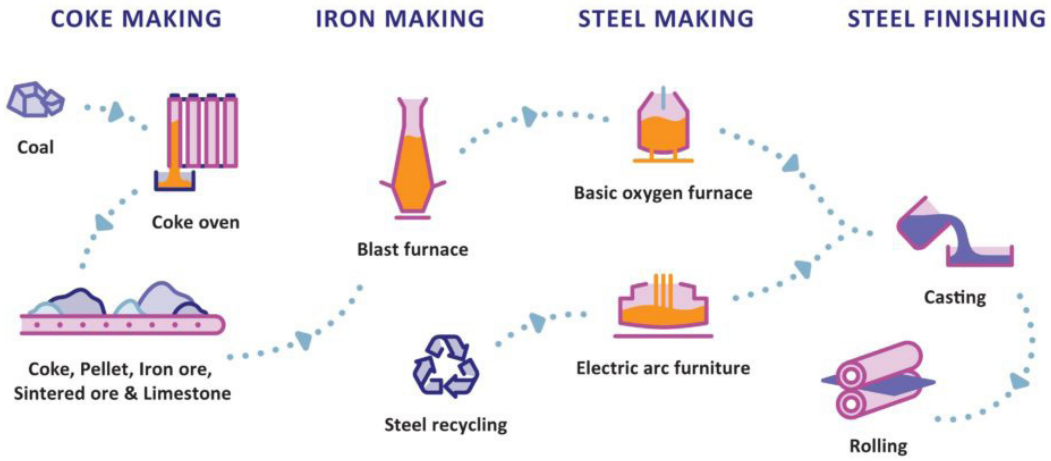
In underground coal mining, almost all excavations are in coal so no significant waste rock dumps are created. The panels are removed in a systematic manner to allow greater control over any surface subsidence.

The final closure and reclamation of underground mines follows the identical processes and desired end points as all industrial disturbance. The materials needed for reclamation are conserved and stored in a safe location during the development of the site. Once all of the manufactured and built facilities are removed, the area is examined to ensure that no near or subsurface contamination has occurred during operations. The area is then prepared and reclamation materials returned to create the building blocks of a functioning ecosystem. Vegetation and land access controls are implemented along with monitoring and closure programs.

APPENDIX C – MAKING STEEL FROM COAL

The process for converting coal to steel follows these steps:

- Steelmaking coal, also called coking coal, is heated in ovens, in the absence of oxygen, to over 1000 degrees Celsius. Without oxygen, coal melts then re-solidifies to produce a hard, durable, porous lumps of almost pure carbon known as metallurgical coke.
- The coke is then fed into a blast furnace with iron ore and the coke supports the iron ore and allows the hot blast to reduce the iron oxide into molten pig iron. Limestone or similar rock is also added to separate the iron from slag.
- The pig iron is tapped from the blast furnace then cleaned up in the basic oxygen furnace and mixed with various alloys to produce different types and grades of finished steel.
- Other steelmaking coals are pulverized and injected into the melting zone at the base of the blast furnace to provide energy where it is most needed. The very highest carbon steelmaking coals, anthracite, are used to sinter iron ore fines into lumps suitable for the blast furnace
- The steelmaking process is energy intensive and the energy from the coke oven gases, the cooling of the coke, and the top gases of the blast furnace are recovered and reused in other processes within the steel plant to maximize thermal efficiency
- It takes approximately 770 kilograms of steelmaking coal to make 600 kilograms of coke, which produces one tonne (1000 kilograms) of steel. (source World Coal Association)



Source - World Coal Association, Steel Production. www.worldcoal.org

Today, more than 70% of steel is made using steelmaking coal, making coal a critical part of our global economy. Work is being done to find ways to lower the environmental impact of creating steel, including alternative processes that use hydrogen and/or electricity to reduce the need for coal.

- Hydrogen can be used in combination with coke (steelmaking coal) to improve the performance of existing conventional blast furnaces, reducing emissions.
- Coal can be replaced by renewable energies, like electricity (through wind or solar) and combined with hydrogen to create green hydrogen.[27]

While these processes show promise, they are not currently at commercial scale or face challenges, such as a lack of industrial level hydrogen, that limit their ability to replace processes that rely on steel making coal. The demand for coal as part of the steelmaking process is expected to continue for the next three decades, until alternative energies become widely available and accessible.

[27] https://www.mckinsey.com/~/media/McKinsey/Industries/Metals%20and%20Mining/Our%20Insights/Decarbonization%20challenge%20for%20steel/Decarbonization-challenge-for-steel.pdf

APPENDIX D – CARBON CAPTURE, USE AND STORAGE (CCUS)

Carbon capture use and storage (CCUS) is a process that prevents large quantities of CO_2 being released into the atmosphere. CO_2 is the largest contributor to global warming and CCUS is expected to play a critical role in transitioning to a lower carbon future.

CCUS can be added to existing infrastructure, including coal-fired power plants, allowing flexibility and time while the world transitions to a lower carbon energy supply. CCUS can also provide a lower cost alternative to building new infrastructure and time for industries that employ millions of people around the world to adapt to their changing environment.

CCUS' vital role in limiting climate change is driving significant interest and innovation in the technology. Many countries, including Canada, are increasing support for CCUS with policy support and research is ongoing, looking for ways to improve efficiency, reduce costs and identify new revenue streams.

CCUS works by:

- Separating the CO_2 produced during electricity generation or industrial processes
- Compressing the CO_2 to a liquid-like state and transporting it for safe use or storage, typically using pipelines or ships.
- CO_2 can be a valuable commodity and is used for a variety of purposes - such as in curing cement, producing plastic materials, in enhanced oil recovery and in algae farming to create biofuel.
- CO_2 can also be permanently stored safely underground in select geological formations.

Other technologies being used include:

- Reducing CO_2 emissions by improving the thermal efficiency of coal-fired power stations through:
- Supercritical, ultra-supercritical and advanced ultra-supercritical - technologies that all plants to operate at higher steam temperatures and pressures than conventional plants
- Integrated gasification combined cycle - a system that produces a gas from coal, that is cleaned of impurities and burned to generate electricity and produce steam for a steam power cycle. This system uses less coal and produces lower emissions.
- Fluidised bed combustion is a method of electricity production where coal, biomass and general waste can be burned, reducing the SOx and NOx emissions considerably.
- Technology to reduce the release of pollutants and waste, such as:
    - Coal cleaning, electrostatic precipitators, fabric filters, wet scrubbers and hot gas filtration - these technologies capture particulates, increase SO2 removal and reduce pollutant release.
    - Reducing waste repurposing and using materials in construction, such as fly ash which can be used in producing concrete.

APPENDIX E – GILRON/MCKENNA REPORT ON SELENIUM MANAGEMENT

To: Alberta Coal Policy Committee

From: Guy Gilron, Borealis Environmental Consulting Inc
Gord McKenna, McKenna Geotechnical Inc

Date: 2021-06-07

Subject: **Written submission on selenium management**

1. Introduction

Alberta's Coal Policy Committee invited Mr. Guy Gilron and Dr. Gord McKenna to provide an independent brief – in advance of discussions on June 9th, 2021 – regarding various aspects of selenium management at Rocky Mountain coal mines. Six questions were provided to Guy and Gord, for consideration prior to those discussions[1].

As requested, we've provided background on our areas of expertise, a statement of our independence, and a statement regarding conflict of interest. Next, each of the questions is briefly addressed and we've followed up with recommendations to the Committee. We have also provided some high-level messages for your consideration. A short PowerPoint slide deck will be used to present this information to the Committee to support the discussion. Additional related information is presented in Gilron and McKenna (2021) and LDI (2021).

2. Expertise

GUY GILRON, RPBio, MSc, BSc, ICD.D
Senior Environmental Scientist, Independent Director
Borealis Environmental Consulting Inc. North Vancouver, BC Canada

Guy Gilron has 30 years of experience in ecotoxicology and ecological and human health risk assessment relating specifically to anthropogenic effects on aquatic and terrestrial ecosystems. Guy has expertise in the development, evaluation and application of water quality guidelines and criteria in numerous jurisdictions in North America and beyond.

Prior to his work as Principal of Borealis Environmental, he served as VP Environment/Regulatory Affairs for Cardero Coal Ltd, and Director, Environmental Science for Teck Resources, based in Vancouver, BC, Canada. In the latter position, Guy contributed scientific input to the Elk Valley Selenium Task Force (EVSTF), a government/industry forum that addressed water quality issues and research in the Elk Valley downstream of Teck Coal mines. In addition to contributing to various research initiatives and publications related to selenium risk assessment, including "Ecological Assessment of Selenium in the Aquatic Environment" (Chapman *et al*., 2010), Guy has played a key role in numerous multi-stakeholder working groups related to selenium assessment, management, and treatment, specifically: the EVSTF; the Canadian Industry Selenium Working Group; the Alberta Selenium Working Group; the North American Metal Council Selenium Working Group (NAMC-SWG),

[1] As directed in an email from Fiona Salkie, Director, Coal Policy Secretariate dated 2021-06-02.

the latter for which he serves as Executive Secretariat; most recently, Guy has served as Science Advisor to the Coal Association of Canada, and several of its members, in support of proposed *Coal Mining Effluent Regulations* multi-stakeholder consultations. Guy has worked on various aspects of environmental aspects of the following representative coal projects:

Operating mines:

- Conuma Coal (Brule Mine) 2018-2020
- Teck Coal (Elk Valley Mines) 2006-2011

Development projects:

- Allegiance Coal (Tenas Project) 2017-2021
- Montem Resources (Tent Mountain) 2020-2021
- CanAus Coal / North Coal (Michel Creek) 2015-2018
- Cabin Ridge Project (with MGI) 2021
- Ram River Coal (Aries Project) 2019-2020

Closed coal mines:

- Smoky River Coal Mine / (sub to BGC) for AER 2017
- Bullmoose Mine for Teck Cominco 2004-2007
- Quintette Mine for Teck Cominco 2004-2007

As part of a multi-year effort by the NAMC-SWG, Guy has served as the technical lead for the group, evaluating various water quality guidelines/criteria and risk assessments for selenium. Guy has been involved as a technical reviewer of the Environment Canada and Health Canada Selenium Risk Assessment/Risk Management documents, the draft USEPA water quality criterion for selenium, and has prepared (together with GEI consultants and Windward Environmental) a state-of-science review of selenium guidelines and criteria in North America, on behalf of the American Petroleum Institute and the NAMC-SWG.

www. borealisenvironmental.ca

BOREALIS
ENVIRONMENTAL
CONSULTING INC

GORD MCKENNA PhD, PEng, PGeol
Geotechnical Engineer, Landform Designer,
McKenna Geotechnical Inc. Delta, BC Canada

Gord McKenna is a geotechnical engineer and geologist who builds mining landforms and watersheds. He possesses over 30 years of experience in the mining industry in mine operations and as an international consultant for oil sands, coal, diamond, and metal mines, regulators, Indigenous peoples, and local communities. He is also an adjunct professor in the Civil and Environmental Engineering Department at the University of Alberta and the founding chair of the Landform Design Institute.

Gord and his teams have designed and built 23 reclaimed watersheds that cover 44 square kilometers and host 37 wetlands and 101 kilometres of streams. He has been a lead contributor to several manuals involving landform design, mine reclamation, and tailings, has co-authored 100 technical papers, and led over 40 landform design courses. He sits on eight geotechnical / tailings review boards across Canada.

Gord was a member of the Strategic Advisory Panel on Selenium Management (2010–2012) and has been involved with supporting research and designing mining landforms to manage selenium, working with numerous Rocky Mountain coal mines and local communities.

Gord has worked on the following coal projects:

- WCC Wolverine Coal geotechnical design (Norwest) 2004-2006
- Teck Cardinal River / Cheviot reclamation audit (Norwest) 2006
- Strategic Advisory Panel for Selenium Management (BGC) 2010-2012
- Teck Coal R&D / landform design (BGC/MGI) 2013-2020
- Coal Valley geotechnical design (BGC) 2013
- CanAus Coal / North Coal landform design (BGC/MGI) 2015-2021
- AER Smoky River Coal / (BGC/MGI/Borealis) geo-environmental investigation 2017
- Livingstone Landowners Group (MGI) engineering review 2019-2020
- Cabin Ridge (MGI/Borealis) Project selenium position paper 2021
- TransAlta Keephills Ash Lagoon (KCB/MGI) landform design 2021

Gord worked on behalf of the Livingstone Landowners from 2019 to 2020 reviewing the engineering / landform design aspects of the proposed Benga Grassy Mountain Coal Project and appeared before the Joint Review Panel as an expert witness.

www.mckennageotechnical.com
www.landformdesign.com
www.gordmckenna.com

McKENNA GEOTECHNICAL

3. Independence

Guy Gilron and ***Gord McKenna*** are independent professional technical consultants who work for the mining industry, various associations, Indigenous communities, local communities, and regulators in Canada and internationally.

Mr. Gilron founded Borealis Environmental Consulting Inc. (Borealis) to generate, apply and integrate scientific data, information, and principles to inform environmental policy and management. Since Borealis' inception in 2013, Guy's work has been categorized as follows: 70% related to coal, metal mines, oil sands projects in Canada and internationally, 15% for industry associations and multi-stakeholder forums, and about 15% (volunteer/professional) as: a Senior Editor of an International Scientific Journal (*Integrated Environmental Assessment and Management*); and, as a Board Member/Vice President for the non-profit organizations, Wildlife Preservation Canada, and the Canadian Ecotoxicity Workshop.

Guy is a Registered Professional Biologist (RPBio; accredited by the British Columbia College of Applied Biology (CAB)) with reciprocity with the Alberta Society of Professional Biologists and the United Kingdom Society of Biology. Mr. Gilron has 'right to practice' in British Columbia under the newly-enacted *Professional Governance Act*. As an RPBio, Guy adheres to the CAB Code of Ethics, which includes requirements for professional practice, including objectivity and independence when providing evidence or testimony.

The majority of Guy's work at Borealis relates to the use of science in supporting the environmental sustainability of mining industry projects. The consulting industry in this field of practice is relatively small; consulting scientists rely on their integrity and professionalism, and accreditation holds them to account for protecting the public. Mr. Gilron's scientific publications (including peer-reviewed journal articles, conference proceedings, book chapters and contributions to regulatory consultations and guidance documents), his work as the Executive Secretariat of the multi-stakeholder North American Metals Council – Selenium Working Group, and his other volunteer work, together provide a profile of a well-recognized and balanced professional. As is the case with Dr. McKenna, Guy seeks to support common vision among diverse stakeholders, sustainable resource use, and socio-economically viable coal mining.

Dr. McKenna founded McKenna Geotechnical partly to be able to provide independent advice to clients. Since inception in 2017, about 5% of its work is landform design for coal mines, about 5% for Indigenous and local communities, and 2% for regulators (contributing to technical guides). About 70% of his work is for oil sands, diamond, and metal mines in Canada and internationally, and about 20% (volunteer) for the University of Alberta, other universities, and for the Landform Design Institute.

Gord is a professional engineer and geologist registered with the Association of Professional Engineers and Geoscientists of Alberta). McKenna Geotechnical Inc. has an APEGA permit to practice in Alberta. The following is extracted from the APEGA code of ethics:

- "Professional engineers and geoscientists shall recognize that professional ethics is founded upon integrity, competence, dignity and devotion to service. This concept shall guide their conduct at all times….
- Professional engineers and geoscientists shall, in their areas of practice, hold paramount the health, safety and welfare of the public and have regard for the environment….
- Professional engineers and geoscientists shall conduct themselves with integrity, honesty, fairness and objectivity in their professional activities."

Given that Gord does most of his work for the mining industry, some can argue that there is a potential conflict of interest. And the geotechnical consulting industry is small enough that few practitioners are truly independent. However, Gord's publications (through the University of Alberta, various conferences, textbook chapters and design guides, the recent work for Livingstone Landowners and presentation to the JRP, his review work for First Nations, his work on the Selenium Panel, and his work and publications through the Landform Design Institute) paint a broader view. Gord seeks to help the various parties set common visions, and "mine with the end in mind" to jointly achieve successful reclamation paints a more balanced approach, for which he is known.

4. Declaration of perceived conflicts of interest relating to this issue

We disclose the following activities pertaining to the Coal Policy Committee (the Committee) discussions, to ensure transparency to the Committee:

1. Guy was invited by the Committee (through a recommendation from Robert Bell of Montem Resources and Robin Campbell of the Coal Association of Canada) to appear before them as an independent scientist with expertise in selenium management.
2. Gord was invited by the Committee to appear before them as an independent scientist with expertise in landform design as it relates to mine design and its use in selenium mitigation techniques.
3. In May 2021, Guy and Gord were retained by the Cabin Ridge Project to develop a White Paper on the state of practice for selenium management for two purposes: submission to the Coal Policy Committee; and, to guide Cabin River Project's mine design. Cabin Ridge has asked us to appear with them, at a separate time, before the Committee.
4. Gord has been invited by Livingstone Landowners Group to appear before the Committee as an independent expert to highlight issues he presented to the Joint Review Panel for Benga's Grassy Mountain Project.
5. Guy was invited by the Coal Association of Canada to appear before the Committee as an independent expert to support discussions related to water quality, selenium management, ecological and human health impacts, and water treatment technologies.
6. Guy was invited by Ram River Coal to appear before the Committee as an independent expert to support discussions related to water quality, selenium management and water treatment technologies.
7. Guy and Gord were both recently interviewed by Bob Weber of The Canadian Press and – based on this interview - an article on Alberta coal mine reclamation and selenium management appeared in Canadian newspapers in May of 2021 (e.g., https://www.cbc.ca/news/canada/calgary/coal-mines-alberta-environment-community-1.60381030).

QUESTIONS and ANSWERS

5. **What are the current world practices (standards) (best available technologies or practices) for managing selenium contamination as a result of surface coal mine activities?**

Selenium is an issue in some areas with respect to agricultural runoff and mine waste a well as some wastewater treatment plant effluents. There are issues related to atmospheric deposition, vegetation uptake in reclaimed mine lands, and in waters downstream of metal mines, coal mines, and power generating stations. The following are areas in which selenium is elevated in waters downstream of operations: Alaskan metal mines, BC metal mines, BC/AB coal mines, Chinese coal mines, eastern US coal mines, US phosphate mines, and US and SK uranium mines. There are likely other regions with mine waste selenium issues that a cursory review did not reveal.

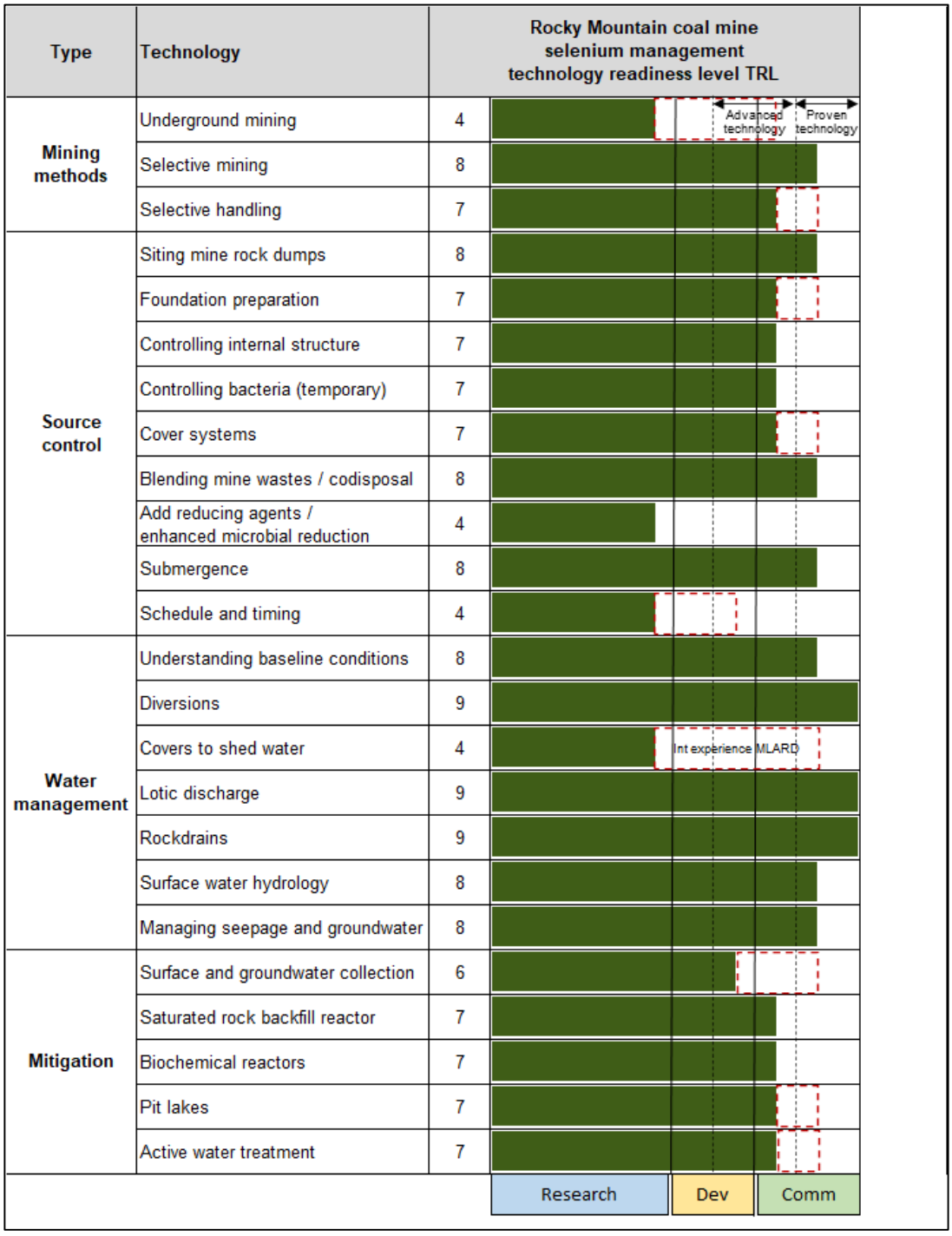
A review of the selenium management state of practice for Rocky Mountain coal mines in British Columbia and Alberta was recently completed by Gilron and McKenna (2021). Based on this review, the general approach employed by the sector is one of multiple-line-of defense, as part of a mine design / landform design process. Figure 1 provides a summary of the technologies employed under four categories – selective mining and handling, source control, water management, and mitigation.

A full international review of selenium management has not yet been conducted; however, the Electric Power Research Institute (EPRI) holds a biennial "Selenium Summit", which explores the state of the science for selenium treatment (https://www.epri.com/events/E53440E6-BEC4-43AF-9072-B709BDE0EF23). A cursory review reveals that the geology and production of selenium is well understood (see Stillings 2017), especially for US geography.

With respect to the mining sector, the cursory review indicates that outside of northeast and southeast BC and Rocky Mountain coal mining, the main selenium management strategies employed are mitigations (e.g., collection of surface water and the use of active and semi-passive water treatment technologies. There are several vendors who supply commercial-scale active water treatment plants for selenium; several mines use semi-passive pit lakes, wetlands, and buried bioreactors to reduce selenium concentrations in runoff water. Much of the literature relates to court cases pertaining to exceedances of selenium water quality guidelines/criteria in downstream waters and the use of various selenium water treatment technologies. Golder (2020) was commissioned by the North American Metals Council Selenium Working Group to provide the most up-to-date review of selenium treatment technologies; their document details what is considered the current state of practice for water treatment.

Technologies for controlling metal leaching and acid rock drainage from hardrock mines are very similar to those being employed for selenium management. There is a rich literature based on decades of implementation at thousands of mines (INAP 2014) with practices and experience now being applied to Rocky Mountain coal mines for selenium management.

Our recommendation: The Government of Alberta should set out specific expectations for coal mines with regard to selenium management; this should include recognizing differences between historical/abandoned mines, proposed mines, existing mines, and closed mines. For each abandoned mine in the province, the Government of Alberta should determine which selenium management methods should be applied, and expedite implementation to meet the mine's EPEA permit goals/objectives/compliance criteria.



Type	Technology	Rocky Mountain coal mine selenium management technology readiness level TRL
Mining methods	Underground mining	4
	Selective mining	8
	Selective handling	7
Source control	Siting mine rock dumps	8
	Foundation preparation	7
	Controlling internal structure	7
	Controlling bacteria (temporary)	7
	Cover systems	7
	Blending mine wastes / codisposal	8
	Add reducing agents / enhanced microbial reduction	4
	Submergence	8
	Schedule and timing	4
Water management	Understanding baseline conditions	8
	Diversions	9
	Covers to shed water	4
	Lotic discharge	9
	Rockdrains	9
	Surface water hydrology	8
	Managing seepage and groundwater	8
Mitigation	Surface and groundwater collection	6
	Saturated rock backfill reactor	7
	Biochemical reactors	7
	Pit lakes	7
	Active water treatment	7

Figure 1. Technology Readiness Level for Rocky Mountain coal mine selenium management (adapted Gilron and McKenna, 2021)[2]

[2] Details of the technology readiness scoring are available in Gilron and McKenna (2021). The assessment tool has been adapted from NASA (2017). Dashed red extensions to the green bars indicate where metal leaching / acid rock drainage technology employed internationally exceeds that for selenium management at Rocky Mountain coal mines.

6. How is selenium monitored in surface and groundwater on and adjacent to coal mines?

Selenium is monitored at coal mines to varying degrees and for various purposes on, and adjacent to, mine sites (including operations or closed/dormant properties). The extent and intensity of these monitoring programs are related to the overall magnitude of exceedances of selenium in water on site, and, more importantly, leaving the site. This includes both surface water and groundwater, although there has generally been a stronger focus on surface water discharges.

The three major purposes for monitoring selenium in water are: understanding site water balance, research and development, and regulatory compliance. The approach and design of these monitoring programs will align specifically to the purposes listed above. For example, understanding site water balance is crucial for assessing the success and efficacy of any mitigations applied at the site; design of the monitoring program temporally (i.e., sampling frequency) and spatially (i.e., sampling locations) will be dictated mainly by site precipitation, topography and hydrology, and the location of mine rockpiles. Monitoring for research and development purposes is usually related to the evaluation of selenium mitigation strategies (e.g., passive treatment system, such as wetland or bioreactor; efficiency of saturated rock fills, cover performance, etc.). Finally, for regulatory compliance, monitoring is usually more 'prescribed', generally dictated by effluent permits; specifically, selenium is monitored routinely at final discharge point(s) ("end of pipe") and/or varying distances downstream of the discharge, beyond the initial dilution zone (usually several sampling locations). The data from the latter monitoring type are used to determine compliance with regulatory effluent limits, site-specific water quality objectives, and ambient water quality guidelines[3].

Groundwater quality (i.e., selenium concentrations in groundwater) is routinely monitored as part of the above-mentioned programs at mine sites, primarily to understand the relative proportion of aqueous selenium leaving a site that seeps into groundwater vs surface water runoff. The level of detail with respect to the spatial resolution of groundwater wells (for compliance) is inconsistent, and is generally not standardized.

Overall, the monitoring of aqueous selenium concentrations in surface water and groundwater should be considered "standard practice" across all coal mines (operating and closed) in Canada. Based on the recent focus on reducing selenium loadings and concentrations downstream of these coal mines, monitoring programs are becoming more comprehensive, and the resulting data are being used to understand, and more effectively manage, selenium.

See the recommendation that follows the next question below.

[3]Currently these are provincial, and site specific; federal *Coal Mining Effluent Regulation* limits are being proposed, but are not yet in place.

7. **What monitoring information is currently available for selenium in our river systems downstream from active and historic coal mining projects? Is selenium being monitored from the outflows from current and former underground and surface coal mines in the province?**

To the best of our knowledge, the only consistent monitoring information/data (water quality sampling and analysis) available with respect to aqueous selenium in river systems downstream of mines-in-development, active/operating coal mines, and closed or historic properties, comes from proponent companies (i.e., those conducting baseline studies, operating mines monitoring per permit requirements, and those managing dormant sites, post-closure). All of the above-mentioned activities are conducted according to specifications in *EPEA*[2] permits, are reported to Alberta Environment and Parks (AEP), and are publicly-available (however, they are likely to require *Freedom of Information Act* requests).

From our understanding, while sampling and analysis can be and are carried out by both provincial (i.e., Alberta Environment and Parks (AEP), Alberta Energy Regulator (AER)) and federal (Environment and Climate Change Canada; ECCC) enforcement officers visiting mines for environmental compliance inspections, there are no regular, routine monitoring programs conducted by either federal or provincial departments/ministries.

Cumulative effect watershed monitoring programs (either industry- or regulatory-driven), similar to the Regional Aquatics Monitoring Program (RAMP; http://www.ramp-alberta.org/ramp.aspx) applied in the Oil Sands region of Alberta, have not been established or implemented for water bodies downstream of active or historic coal mines.

Our recommendation: AEP should be consulted for an update specific to selenium monitoring in Alberta rivers and lakes in the vicinity of coal mines.

Our recommendation: That the Alberta Government promptly establish an integrated regional aquatic monitoring program for the Eastern Slopes that includes a formal water-quality sampling component with a database that is accessible on-line shortly after these data are collected. The program should also monitor fish tissue (and other biota) relative to selenium. The monitoring should be designed, carried out, and analyzed in collaboration with the mines, local communities, and Indigenous Peoples. The database and associated analyses should include surface water and groundwater sampling results from compliance monitoring by individual mines. The sampling should complement data from existing stream-flow measurement stations. Most importantly, this work should be linked to the Alberta Coal Policy.

8. Must a selenium management and mitigation plans be filed for current coal mining proposals? Are there standard conditions for handling selenium that must be applied to approvals for coalmines?

Yes. While selenium management and mitigation plans (SeMMP) have only recently (i.e., in the last 5-10 years) become a requirement for coal mines, it is currently an expectation that new coal mine proposals include SeMMPs for the purposes of: evaluating project sustainability (feasibility study), obtaining environmental assessment (EA) certificates, and, ultimately, for mine permitting (in Alberta (AB), under *EPEA*[4] permits; in British Columbia (BC), *Mines Act* permits). The development of SeMMPs are usually preceded by what is referred to as a "Selenium Management Options Analysis", the purpose of which is to evaluate the site-specific opportunities for managing/mitigating/treating selenium. Some examples: a given mine's location and site topography may make it difficult to establish a wetland or bioreactor; a pit lake could not be part of an underground mine, in a situation where an open pit is not available; active treatment (and associated cost and infrastructure) is not justified, given the magnitude of exceedance of selenium.

An example table of contents of a standardized SeMMP is provided below:

1.0 INTRODUCTION
2.0 REGULATORY FRAMEWORK
3.0 CURRENT CONDITIONS
4.0 SELENIUM CONCENTRATION PREDICTIONS
5.0 WATER QUALITY OBJECTIVES FOR SELENIUM
6.0 SELENIUM MANAGEMENT ACTIVITIES
7.0 AQUATIC ENVIRONMENTAL MONITORING PROGRAM
8.0 RECORD KEEPING AND REPORTING
9.0 ADAPTIVE MANAGEMENT
10.0 REFERENCES

APPENDICES
Appendix A Water Quality Sampling Results
Appendix B Selenium Management Options Analysis
Appendix C Conceptual Water Management Design
Appendix D Hydrology Report
Appendix E Selenium Load Balance Model
Appendix F Selenium Source Terms

SeMMPs are often linked to other aspects of site environmental management plans, including: site water management (dealing with other chemicals of concern, potential acid rock drainage), explosives management (since nitrate can often be co-treated with selenium), and calcite management. For this and other reasons (e.g., sensitivity of downstream receptors), it is crucial to develop an integrated approach to site water management, which includes the management of selenium.

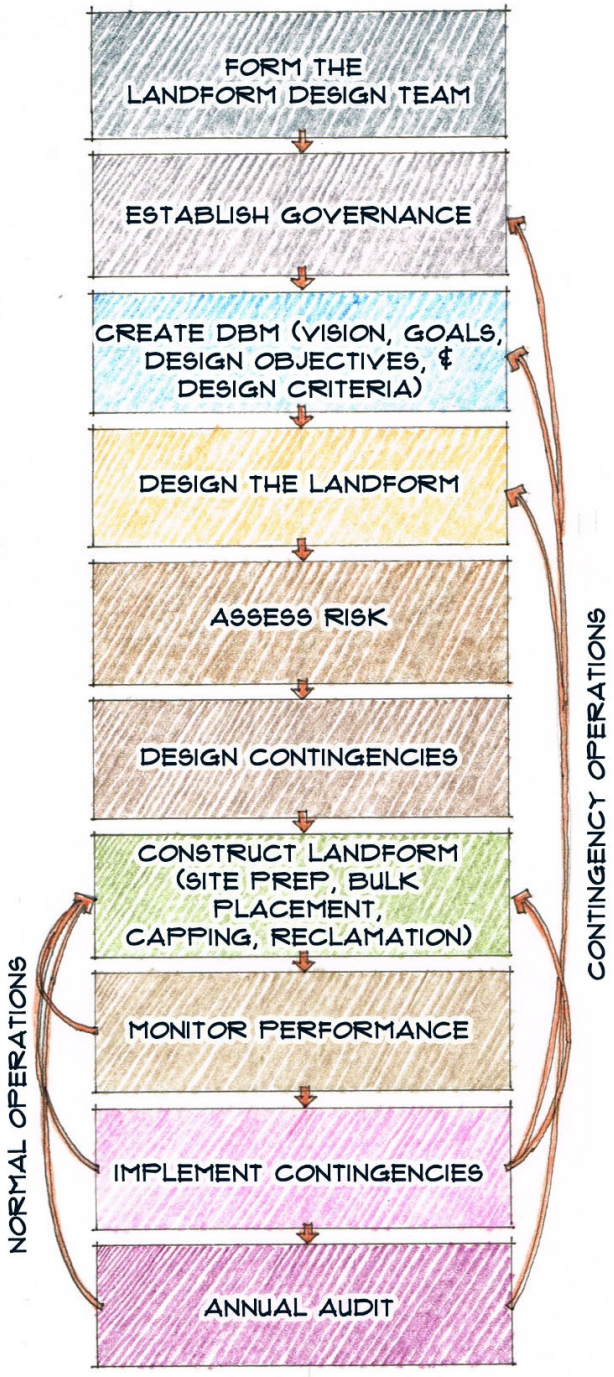
At some mines, given the potential for long-term semi-passive or active treatment of selenium after mine closure, SeMMPs are more often linked to the financial security bond for a mine (e.g., MFSP[5] in Alberta), given the potential significant expenditures associated with active selenium treatment systems and other non-treatment system mitigations (e.g., reclamation/development/monitoring of pit lakes).

[4] *EPEA - Environmental Protection and Enhancement Act*
[5] MFSP – Mine Financial Security Plan

In AB and BC, numerous operating coal mines (e.g., Teck Coal's Elk Valley mines; BC), proposed coal mine developments (e.g., Tent Mountain; AB, Michel Creek; BC), and mines in suspension (e.g., Grande Cache; AB) have comprehensive SeMMPs; these are to be considered in the realm of "standard practice".

See our recommendation at the end of the first question above.

9. Summary / main messages



- Elevated selenium in water downstream from coal mining is a serious issue, which can potentially have major impacts on the aquatic animals (fish, aquatic birds) and the sustainability of coal mining.

- Selenium needs to be managed and regulated, and both of these activities should be informed by the emerging science.

- Selenium management is a key aspect of landform design, mine design, construction, operation, reclamation, and aftercare.

- Selenium management should utilize a multi-pronged approach, which includes good design, the application, implementation and integration of various mitigation and treatment strategies and technologies, and a comprehensive monitoring program developed as part of the overall management system.

- Collaboration related to selenium management with all stakeholders is necessary to achieve a common vision and common goals.

- Selenium is the focus of this presentation. However, selenium management is just one of many environmental issues that need to be identified, designed for, and managed. The integration to achieve the vision, goals, and objectives for operating and reclaimed mine sites is the focus on landform design (LDI 2021), and a major focus of Rocky Mountain coal mining, more generally.

Figure 2. **Landform design process – selenium management is one aspect of this work. There are parallels (but also crucial differences) with adaptive management.**

10. Literature cited

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